Evolution of the Navy's Industrial Radiological Controls Program

Today's Program Showcases Successful Remediation Actions, New Instruction & Guidance

REMEDIATION IS ALWAYS a complex process, but remediation of radiologically contaminated areas poses an especially difficult challenge. This challenge is being met by personnel from the Chief of Naval Operations Energy and Environmental Readiness Division's (N45) Radiological Controls (RADCON) Branch Office and their technical support centers as they support an immense cleanup effort at three California locations and generate new instructions and guidance to ensure the proper management of radioactive materials across the Navy.

The largest of these cleanup efforts is taking place in the area once known as Hunters Point Shipyard (HPS), in south San Francisco. The site consists of 936 acres—493 on land and 443 under water in San Francisco Bay. The site was closed in 1994 as part of the Base Realignment and Closure (BRAC) program, and radiological contamination was discovered as environmental restoration activities were occurring on the grounds.

To assist with the radiological cleanup, a Navy contractor established a state-of-the-art on-site radiological laboratory,

Hunters Point.
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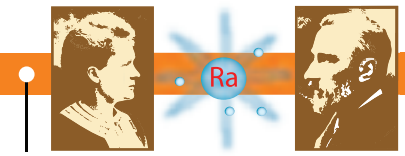
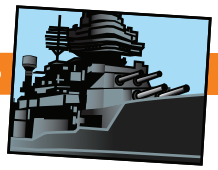


1898: Marie Curie (with husband Pierre's assistance) isolates radium

1917–18: U.S. uses radioluminescent items in World War I

1939: U.S. Navy purchases Hunters Point Shipyard (HPS)

1941: U.S. enters World War II



1942: HPS is expanded to support war efforts

capable of screening for radioisotopes at extremely low levels to meet the very conservative remediation goals set for the shipyard. Over 87,000 soil samples and over 1,200 groundwater samples were analyzed for various types of radioactive materials. Using an on-site laboratory allowed soil samples to be turned around within 24 hours, as opposed to the 30 to 45 days it would take to get data back from an off-site laboratory. With powerful, near "real time" on-site laboratory capabilities, the Navy was able to make in-the-field remediation decisions much faster and without the expensive mobilization/demobilization required by the radiological contractors.

The Navy's largest removal action at HPS, which has been ongoing since 2006, involves removing over 34 miles of sanitary and storm drain sewer lines to deal with low-level radiation that was discovered throughout the system. Other actions include removing fuel pipelines, removing or reclaiming soil, and demolishing entire buildings. To date, approximately 65 percent of the radiologically impacted areas have been cleared through a process of excavation and disposal. Approximately 859 acres remain to be transferred pending further environmental cleanup actions. (Note: For more information about BRAC, visit www.bracpmo.navy.mil.)

Radium's Early History

The situation at Hunters Point is far from unique. During the heyday of the radium era, disposal was not regulated and radioactive commodities were disposed of with the common trash. This means that just about every military and commercial landfill dating back from the early 20th century to the early 1970s could contain some type of radium devices. Fortunately, the large majority of these devices have very small amounts of radioactivity.

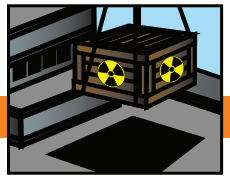
The harmful effects of radium were not known for many years. In fact, shortly after Madame Curie isolated radium around the turn of the 20th century, there was a notable interest in the element and its implied medical uses. In 1903, Dr. Willy Meyer used radium to treat an incurable tumor, and it was observed to shrink and become less painful, though the patient ultimately died. Soon radium was hailed as the cure-all, and a number of "health items" entered the market. These products ranged from radium suppositories to radium toothpaste, and included such items as a "radioendocrinator" to help male potency. These claims are still exploited in other parts of the world today.

Radium in the Services

When World War I started, the military needed to coordinate night operations,

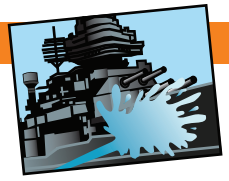
Just about every landfill dating back from the early 20th century to the early 1970s could contain some type of radium devices.

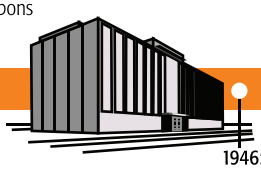
and started buying watches and other commodities that were radioluminescent. In particular, the Navy bought thousands of deck markers. The deck markers were used to identify the edges of the piers, dry docks, and many areas in a ship, very similar to the bridge markers used by the Army. Additionally, many of the dials on a ship or in aircraft were radioluminescent. During World War II, personnel markers were added to the list of radioluminsecent devices. These were clip-on devices that personnel would wear at night for better visibility. Also, gamma radiography began to be used



1945: Nuclear materials to support the atomic bomb are loaded onto USS Indianapolis at HPS

1946: Ships returning from Pacific nuclear weapons testing are decontaminated at HPS





1946: Naval Radiological Defense Laboratory (NRDL) is established at Hunters Point

1946: Atomic Energy Commission (AEC) is formed

1969: NRDL is disestablished

Sampling in soil screening yard.

With powerful, near "real time" on-site laboratory capabilities, the Navy was able to make in-the-field remediation decisions much faster.

as a control for quality assurance of welds. Medically, it was used to treat the sinuses of submariners who could not equalize during a dive.

One of the disadvantages of radium was that the energy of the alpha particle emitted during decay is very strong and ended up burning the zinc-sulfide that causes the luminescence. This meant that dials eventually lost their radioluminescence and had to be refurbished. The Navy set up radioluminescence dial shops at the Navy's depots—now its Fleet Readiness Centers. Based partly on the experience of the "Radium Girls," the Navy realized the problems associated with radium paint shops and issued regulations on the proper handling of the material. (For more information, read our sidebar entitled, "The Radium Girls.") However, these regulations were only effective up to a point since there were no disposal directions.

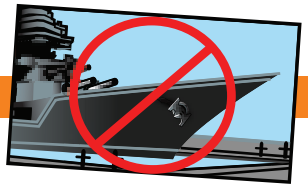
Managing Radioactive Devices

In 1946, the Navy played a large role in the development of the Atomic Energy Commission (AEC). The main purpose of the AEC was to transfer control of atomic energy into civilian hands. Ten years later, the Atomic Energy Act was passed, which included requirements for the management of radioactive materials. However, the instructions for disposal of radioactive materials was still somewhat vague and was restricted to "licensed facilities." For example, in the late 1950s, one of the disposal plans sanctioned by the AEC included hiring licensed commercial boats or Navy ships to haul 55-gallon drums of radioactive waste out to sea, to be dumped overboard into deep water.

The Nuclear Era

As the Cold War accelerated and nuclear power plants came onto the scene, more and more radioactive waste was entering the air and water in myriad ways. It was clear to scientists (and to the public) that a new solution was needed. By the early 1960s, geologic storage was the accepted waste management strategy within the AEC for high-level radioactive waste (waste from nuclear power plants).

However, according to the U.S. Environmental Protection Agency (EPA)



1974: Navy ceases shipyard operations at Hunters Point Mare Island shipyard continues using part of the facility

1974: AEC is disbanded—Department of Energy and Nuclear Regulatory Commission (NRC) take its place

1982: The Nuclear Waste Policy Act is signed into law

1982: The Chief of Naval Operations establishes the Radiological Controls program office

1987: The Navy receives Master Materials License from NRC

Sewer and storm drain removal.

Excavation awaiting backfill.

records, the AEC faced stiff resistance when they announced plans to locate an underground storage facility in an abandoned salt mine near Lyons, Kansas. This led to a long period of uncertainty about what to do with radiological waste.

When EPA was founded in 1970, the AEC's authority to issue generally applicable environmental radiation standards was transferred to EPA. In the mid-1970s, the AEC itself disbanded, splitting into two separate agencies—the Department of Energy (DOE) to handle research, and the Nuclear Regulatory Commission (NRC) to regulate the industry.

A decade or so later, the Nuclear Waste Policy Act (NWPA) of 1982 was passed. The NWPA assigned DOE the responsibility to site, build, and operate a deep geologic repository for the disposal of high-level waste and spent nuclear fuel. Today, this repository is located at Yucca Mountain, Nevada, but is not in use and there are current plants to close the site.

Also in 1982, Chief of Naval Operations Admiral James Watkins set up a coordinating office on radiological controls at the Office of the Chief of Naval Operations (OPNAV) level. The modern RADCON branch was born.

Due in part to the robustness of the industrial RADCON program, the NRC approached the Navy about becoming a partially self-regulating organization

1988: HPS closes as part of Base Realignment and Closure (BRAC) program

1992: Remediation begins at Hunters Point

1997: Naval Air Station Alameda and Naval Station Treasure Island are closed due to BRAC

2004: First transfer of 75 acres from HPS

2012: Radiological remediation is in full swing at HPS, Treasure Island, Alameda and other bases affected by BRAC

The History of Hunters Point

IN 1941, JUST days after the Japanese attack on Pearl Harbor, the Navy took control of a ship repair facility known as Hunters Point, formerly leased to Bethlehem Steel. A series of quays, docks, and support buildings were built on an expedited wartime schedule at the facility to support the yard's mission of fleet repair and maintenance. A major expansion on the north side of the shipyard occurred during 1942 and 1943 when a submarine servicing facility consisting of dry docks and industrial and barracks buildings was completed.

In 1945, HPS served as the loading point for the radioactive materials used in the atomic weapons that were dropped on Hiroshima and Nagasaki. The components were transported to a "safe house" at HPS, where they awaited the USS Indianapolis. The exact location of the "safe house" and the exact time the weapon components arrived has not been determined. Every security precaution was taken, including emptying all dry docks and berths at HPS.

Immediately after the end of World War II, the Navy used the expansive berthing facilities at HPS for reserve fleet ships returning from the Pacific. In 1946, this berthing was interrupted by the return of the Navy target and support ships from the two atomic tests conducted at Bikini Atoll in the South Pacific.

The return of these ships resulted in the creation of a special radiation safety office–the Naval Radiological Defense Laboratory (NRDL). In addition to handling radiological decontamination of these ships, the NRDL conducted research and experiments on radiological decontamination, the development of radiation detection instruments, and the effect of atomic weapons on living organisms, equipment, and vessels.

Throughout the 1950s and 1960s, HPS continued to operate as a shipyard. Its name was changed to Treasure Island Naval Station Hunters Point Annex after it went under BRAC. In 1974, the Navy ceased shipyard operations at HPS. From May 1976 to June 1986, Triple A Machine Shop, Inc. leased most of HPS from the Navy and operated these leased areas as a commercial ship repair facility.

Remediation at Hunters Point under BRAC began in 1992, when EPA signed a Federal Facilities Agreement with the Navy and the State of California to establish agreed upon requirements for environmental investigation and cleanup and ultimate transfer of the property to the City of San Francisco.

in 1984–5. In 1987, the Chief of Naval Operations Environmental Protection, Safety and Occupational Health Division (now the Energy and Environmental Readiness Division) received a Master Materials License from the NRC, granting it authority to train, inspect and certify others in the Department of Navy who handle and manage radioactive materials from cradle-to-grave. Unlike the NRC, the RADCON program can operate wherever the Navy has a presence—be it on a ship at sea or a facility on foreign soil.

How RADCON Works

N45 is the resource manager for radiological control issues—they oversee policy and provide management via the Naval Radiation Safety Committee. The program managers for RADCON are the Naval Sea Systems Command (NAVSEA) 04N Radiological Controls Office and the Navy Bureau of Medicine and Surgery (BUMED). NAVSEA 04N is in charge of industrial uses of radiological material. Technical

View of San Francisco.

support for this office comes from the NAVSEA Detachment, Radiological Affairs Support Office (RASO). BUMED helps regulate nuclear medicine, with technical support from the Navy and Marine Corps Public Health Center (NMCPHC). Both RASO and NMCPHC are staffed with inspectors and assist personnel who ensure that radiological equipment and materials are being used properly and that all safety precautions are being followed.

For any Navy office or facility to be able to handle radioactive materials, they must first apply for a Naval Radioactive Materials Permit (NRMP) from the Naval Radiation Safety Committee. (Note: The Naval Nuclear Propulsion Program and the Naval Nuclear Weapons Program are not covered by this program). This application insures that a command has the proper operating, training and emergency procedures in place for the safe use of radioactive materials.

The application must include, among other things, names of the person or persons to be held responsible, training plans, emergency preparedness plans, and a diagram of proposed storage facilities. The application is a lengthy interactive process between a technical support center and the applying command, which lasts for several months (and up to a year) to review the training, operating and emergency procedures, inspect the facilities, and insure that all safety issues have been addressed. Once the committee is assured that the command is safe, they issue the NRMP, which allows a command to acquire and use radioactive materials.

The Radium Girls

THE WOMEN WHO worked with radium as watch-dial painters in the 1920s began to develop cancerous tumors, bone problems, and suffered painful amputations. Health workers learned that these women were instructed to lick their brushes while working to get a good point on the end of the brush for their detailed work. This resulted in them ingesting what often amounted to lethal quantities of radioactive compounds. The case of the "Radium Girls," which included workers from Ottawa, Illinois and Orange, New Jersey, made its way to the top of the country's the legal system, reaching the U.S. Supreme Court in 1939. The women won a modest settlement and helped to shape U.S. labor law.

Source: Voice of America (www.voanews.com/content/radium-girls-remembered-for-role-in-shaping-us-labor-law-129169888/144746.html)

Time-critical removal action underway.

The NRMP is granted for ten years, and then it must be renewed, utilizing the same process (and same time frame) as applying for a new permit.

Inspectors from RASO and NMCPHC perform regular inspections of facilities and equipment that utilize radioactive materials. The period between inspections varies depending on the relative risk of the operation. Inspections are unannounced, and performed with the assistance of command management. According to the Naval Radiation Safety Committee Standard Operation Procedures manual, "The inspection will consist of observations of permittee operations, interviews with staff, and document review to supplement inspector observations. Radiation surveys will also be conducted. Emphasis should be placed on observing permittee performance as it relates to staff training, equipment operation, overall management of the permitted program, and integration of safety." (For more details, see our sidebar entitled, "The Naval Radiation Safety Committee Standard Operation Procedures.")

Inspectors and permit reviewers must attend a minimum of five courses, as well as other courses in industrial or medical specialties as needed. In addition, they are expected to read all applicable codes and regulations and participate in site visits. Refresher training is provided during periodic staff meetings. Finally, all inspectors and permit reviewers must complete at least 24 hours of formal training per year on such topics as environmental

The Naval Radiation Safety Committee Standard Operation Procedures Manual

AMONG OTHER DIRECTIVES, this manual outlines the standard operating procedures (SOP) for both the industrial and medical technical support teams. The section on inspections specifies the manner in which inspections are conducted. Basically, these consist of observation, interviews, document reviews, and independent and confirmatory measurements. The inspector then writes up a report–making sure to inform the Executive Secretary immediately if any Notices of Violation (NOV) are found. If NOVs are found, the command is given 30 to 60 days to respond regarding the root cause for the NOV, corrective steps that have been taken and results achieved, steps that will be taken to avoid future NOVs, and the date when full compliance is expected.

The manual discusses and classifies NOVs according to various severity levels, and outlines SOPs for each scenario. It also addresses repetitive violations and enforcement actions, which may include conferences with the permittee, and, in severe cases, revocation of the permit.

Trench sampling from manlift.

monitoring and modeling, dosimetry (radiation detection instruments), decommissioning, and regulatory updates.

Low-Level Waste Disposal

The Low-Level Radioactive Waste Policy Act of 1980 gives each U.S. state the responsibility to develop a method for disposing of its Low-Level Radioactive Waste (LLRW). LLRW is defined by the Atomic Energy Act of 1954 as "radioactive material that is not categorized as high-level radioactive waste, transuranic waste (waste containing artificially manufactured radioactive elements), spent nuclear fuel, or byproduct material," and which the NRC classifies as LLRW.

To comply with this Act, the Department of the Navy (DON) formed its Low-Level Radioactive Waste Disposal Program. The DON LLRW Disposal Program provides a means to minimize the storage of unwanted DON radioactive material worldwide, reduce the potential for radioactive contamination and personnel radiation exposure, and ensure proper disposal of LLRW. All DON activities are required to dispose of LLRW through the DON LLRW Disposal Program. DON activities must submit requests for LLRW disposal to RASO who will then coordinate all disposals through Department of Defense LLRW Executive Agency in full compliance with federal and state regulations. Currently, there are four disposal sites for LLRW in the U.S.:

Implementation of Web Site Will Further Enhance RADCON Program

THE NAVY ENVIRONMENTAL Sustainability Development to Integration (NESDI) program initiated the development of a workflow database tool to further enhance the management and operation of the RADCON program. The new tool (called the Radiological Affairs Support Program Web tool or RASPWeb for short) will capture, manage, and track all data associated with RASP inspections and inventories; and issue, track, and archive voluminous NRMP correspondence and associated data.

Currently, all inspection, permitting, and inventory processes associated with RASP are tracked in a standalone Microsoft Excel-based management system that is cumbersome and inefficient, affords limited user access, and may be subject to common administrative errors. This approach incurs additional burden to Radiological Affairs Support Office (RASO) staff.

RASP management processes will be completely overhauled and workflow processes dramatically streamlined by implementing a secure, enterprise-wide, web-enabled database tool. Moreover, RASPWeb will be built off of the existing, proven framework of similar Navy web applications and database environments, working to leverage efficiencies by reducing both development time/cost and risk. The ultimate goal is for RASPWeb to replace everything feasible that is currently stored in physical hard copy format with an efficient, flexible framework that seamlessly manages workflow and correspondence, and is readily accessible to the Navy radiological user.Implementation of RASPWeb will enable RASO staff to maintain their core mission focus while ensuring a high degree of compliance with environmental rules and regulations.

Personnel from RASO and the Naval Facilities Engineering and Expeditionary Warfare Center are developing and validating the requirements for RASPWeb as part of NESDI project #495–the Radioactive Material Permit Generation, Management, and Tracking System.

For more information about the NESDI program, visit www.nesdi.navy.mil.

Sampling former isotope storage vault.

1. Clive, Utah
2. Grandview, Idaho
3. Richland, Washington
4. Andrews, Texas

To assist with LLRW disposal across DON, new instructions are being prepared by N45, and are expected to be released within the year. (Note: All Navy instructions can be downloaded from http://doni.daps.dla.mil.)

New Instruction on Licensed & Exempt Materials

N45 issued a recent instruction regarding the handling of generally licensed and exempt materials (OPNAVINST 6470.4). The purpose of the instruction—ACQUISITION, USE AND DISPOSAL OF CERTAIN NUCLEAR REGULATORY COMMISSION REGULATED RADIOACTIVE DEVICES AND SOURCE MATERIAL—is to establish Navy policy for the acquisition, use, and disposal of various categories of devices and material regulated by the NRC. These categories are as follows:

1. Exempt devices.

   This refers to consumer devices not generally recognized to pose an unreasonable risk to human health and safety and includes such items as smoke detectors, self-luminous watches, and some rifle scopes.

2. Generally licensed radioactive devices.

   These are devices manufactured and distributed under a specific license issued by the NRC or by an agreement state, and are deemed safe for use by personnel with no radiation safety training. Some examples include gas chromatograph units, static eliminators, luminous exit signs, and calibration or reference standards.

Screening Soil for Radioactive Components

DURING REMEDIATION, SOIL is tested for all sorts of contaminants. Typically, soil samples are scooped into premeasured compartments and tested for heavy metals, pesticides and polychlorinated biphenyls. Radium testing can be done in the laboratory, but because of the radioactive emissions, a different process is often used. At Alameda Point, all potentially contaminated soil is collected and dumped into a screening area the size of a tennis court, and graded smooth to a depth no greater than 12 inches. Then an electric vehicle with a scanning rig and Global Positioning System mapping system drives back and forth over every inch–at what the Alameda Environmental Office describes as "the pace of a turtle." If any radiation is detected, it is mapped onto a computer, and the area is scooped up and placed in a LLRW bin. This is a time-consuming process, but it is very thorough. However, it is slowed even further when it rains since the process cannot take place when soil is wet.

Preparing discharge channel for survey.

Pickling tank demolition.

3. Generally licensed radioactive devices above a certain quantity.
   Some of the materials that fall into category 2 have isotopes that equal or exceed a certain level. (The instruction specifies what the level is for various substances.) Navy and Marine Corps activities are prohibited from acquiring or using this material, except as authorized under a permit of the Naval Radiation Safety Committee.

4. 'Unimportant' quantities of source material.
   Some examples include thoriated tungsten welding rods, depleted uranium counterweights in aircraft or rockets, magnesium-thorium alloys for aircraft engines, piezoelectric ceramics, vacuum tubes, thoriated lenses, and germicidal lamps. This material may be restricted in quantity.

Drydock 4 caisson.

The Basics About Uses of Radioactivity in the Navy & Marine Corps

AS IN THE rest of modern society, devices containing small amounts of radioactivity are common throughout the Navy and Marine Corps. Industrial radiography, for example, is used to X-ray aircraft and ships as part of routine inspection. Radiography is also used for package security inspections. Nuclear medicine employs radiation in many diagnostic tools such as X-ray and CT scan machines, teletherapy (use of an external beam radiotherapy), and irradiation to eliminate bacteria. Other examples of equipment capable of producing ionizing radiation include particle accelerators, electron microscopes, and laboratory analytical devices.

RASP covers these types of devices as well as commodities containing radioactive material such as:

- Electronic devices (electron tubes)
- Luminescent/self-illuminating devices (watches)
- Ionization devices (smoke detectors)
- Analytical devices (gauges)
- Items containing natural radioisotopes (aircraft/vehicle parts and welding rods)

5. Generally licensed source material, such as uranyl acetate used in electron microscopy and thorium dioxide used in crafting high quality lenses.

   Navy and Marine Corps activities are prohibited from acquiring or using this material, except as authorized under a permit of the Naval Radiation Safety Committee.

Decommissioning & Remediation

The NRMP and the technical support offices are both managed by N45 through the Radiological Affairs Support Program (RASP). The RASP manual requires that each command maintain a detailed record of where all radioactive material is or has ever been stored, along with the type and amount of said material. These records "should identify areas where there is a reasonable likelihood that contaminants may have spread to inaccessible areas including seepage into porous materials such as concrete."

A site may be decommissioned prior to the NRMP expiration, or if the command decides to permanently cease operations involving the use of permitted radioactive material. Decommissioning may apply to an entire facility or a single building.

The RASP manual describes the steps that must be followed during the decommissioning process. One of the first steps includes conducting a Historical Radiological

Assessment (HRA) to determine the location and level of radioactive contamination remaining in the facility or area.

The guidelines for a Navy HRA are equivalent to the guidelines for a Historical Site Assessment that were established in the Multi-Agency Radiation Survey and Site Investigation Manual. Through research, interviews and site visits, an HRA is prepared that will document, refine and expand the record of historical radiological activities at the facility. For BRAC sites, the HRA is used to facilitate transfer of the property for civilian redevelopment. Information for the HRA comes from record searches, interviews, and site visits regarding locations where radioactive materials may have been used, stored, or disposed.

The HRA for Hunters Point, for example, covered 882 historical and current sites and support areas. Of these, 91 were identified as radiologically impacted to some degree.

If needed, the facility will be required to develop a decommissioning plan to remove residual radioactive contamination to levels prescribed by NRC regulations. The plan is required to include:

- Current radioactive contamination levels at the site
- The criteria for the final condition of the site
- A process to remediate existing radioactive contamination not currently authorized by the NRMP (if applicable)
- Procedures to protect workers performing decontamination
- Decommissioning cost estimates
- The final survey method to demonstrate compliance with NRC release criteria
- A schedule for remediation activities and NRMP termination

Concrete-encased pipe awaiting survey.

Furnace demolition.


Gun mole crane.

If naturally occurring radiation is found, remediation proceeds following the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) model. Commonly known as Superfund, this process involves a preliminary assessment, a feasibility study, records of decision, a remedial plan, construction and post-construction phases, and a plan for site reuse or redevelopment.

If licensed radioactive material is found, cleanup proceeds according to NRC rules. In the case of Hunters Point, both types of radiation were found. To avoid duplicative efforts, the NRC agreed to review the documents generated under CERCLA for compliance with their regulations.

What is Radiation?

RADIATION IS ENERGY in the form of waves or moving subatomic particles, occurring naturally or in manmade form. Some naturally occurring sources of radiation are our own atmosphere, our soil, water and vegetation. Manmade sources of radiation include televisions, medical machinery (such as X-rays), and linear accelerators.

Ionization is the process by which an atom or molecule changes into an ion—a particle with a net positive or negative electrical charge. Ionization occurs when there is an imbalance between the total number of electrons and the total number of protons. Ionizing radiation has enough energy to excite and remove electrons when it comes in contact with other matter. Enough ionizations can be destructive to biological organisms.

Types of ionizing radioactivity include:

- Alpha and beta particles (both of which are easily stopped by air or cloth and difficult to detect)
- Gamma rays
- Neutron particles (which rarely occur naturally and are also difficult to detect)

Other Impacted Sites

The former Naval Station Treasure Island California is also undergoing remediation. Treasure Island is a man-made island located in the middle of San Francisco Bay, and was constructed from dredged sediments for inclusion in the 1939 Golden Gate International Exposition. The Navy, which operated a base on adjacent Yerba Buena Island, acquired Treasure Island in 1942. The island became a major naval facility during World War II, processing approximately 12,000 outgoing and incoming military personnel per day. It was closed in 1997.

The Navy has been working with the State of California for more than 20 years under a consultation framework established by a 1992 Federal Facilities Site Remediation Agreement to protect human health and the environment. According to the Navy's BRAC web site (www.bracpmo.navy.mil), an HRA was conducted for Treasure Island in 2006, which assessed 542 historical and current sites (buildings, structures, and open areas). Eighteen sites were identified as requiring further review. Of those 18 sites, five sites were designated as "impacted." Radium-226 was found in one area—the former bunkers. All impacted soil from this area has now been screened and properly disposed of. New work has identified radium in three other areas and their associated drain systems. Remediation is ongoing at these areas.

The Navy is working on a supplemental Technical Memorandum to the HRA in August 2012 to identify additional areas on the installation that may require further evalua-

WA 17 almost complete.

tion for radiological contamination. All continuing radiological response actions are being undertaken in cooperation with the State of California.

N45 is also overseeing radiological remediation efforts at the former Naval Air Station Alameda, California, commonly known as Alameda Point. Alameda Point, located immediately southwest of Oakland, contains a National Register eligible World War II Historic District and is currently a host to the USS Hornet museum via lease to the City of Alameda.

The Navy did extensive soil testing at Alameda Point over the years. An HRA was performed at Alameda Point and it concluded that of the 685 historical and current sites, 23 were designated as potentially impacted. Surveys have since confirmed contamination in seven locations, which include four sites, two buildings and the drain lines from these two buildings. Remediations have been performed and characterization surveys have confirmed the need for further surveys/remediations within two buildings.

Whether it's limiting the use of radioactive materials, ensuring that personnel are using them safely, or aiding in the remediation of contaminated soil and water, RADCON is dedicated to supporting the Department of Defense's mission while safeguarding the health of Sailors, Marines, Soldiers and civilians. ⚓

For More Information

FOR MORE INSIGHTS into the Navy's use of radiography, see our story in the fall 2012 issue of Currents entitled, "Going Digital: Assessing the Viability of Computed Radiography." To subscribe to the magazine or browse the Currents archives, visit the Department of the Navy's Energy, Environment and Climate Change web site at http://greenfleet.dodlive.mil/currents-magazine.

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